

# Unit B Conclusion

Human activity has made an impact on the environment. In this unit you learned about the impact of many important parts of Alberta's economy, including electricity generation, oil and natural gas production, agriculture, and the production and use of consumer products involving organic compounds. You also examined the processes involved in the production of acid deposition, ground-level ozone, volatile organic compounds, and persistent organic pollutants. From your study, you should be able to identify concerns associated with the presence of these substances in the environment and with the technologies and changes that serve to reduce their production.

Exposure to certain chemical compounds can have negative effects on human health, causing mutations to DNA—a topic developed in Unit A. Radiation, described in Unit C, that reaches Earth's surface due to damage to the ozone layer as a result of the release of chlorofluorocarbons can also cause mutations.

Studying the environmental effects caused by substances released into the environment is essential to preventing further harm in the future.

## Career Profile

### Executive—Oil and Gas Resource Development

"Since we are made from the same source and elements, humans should feel a greater connection to the environment," states Elmer Ghostkeeper. Wisdom, defined by Elmer, is the combination of the experience, knowledge, spirit, mind, and emotion a human being can serve as a guide when considering activities that might effect the environment.

As president of Métis Moccasin Resources Inc.—a majority Métis-owned oil and natural gas company—Elmer urges the use of practices that attempt to minimize negative environmental impacts to the parts of the ecosystem we can see and to those parts that we cannot see. Consideration of possible "invisible" effects includes changes to the composition of soil, air, and water. Practices that result in the pollution of "air, water, and soil demonstrate disrespect for the environment and ourselves," states Elmer when referring to many current practices that reduce environmental quality and the need humans have for fresh air and water.

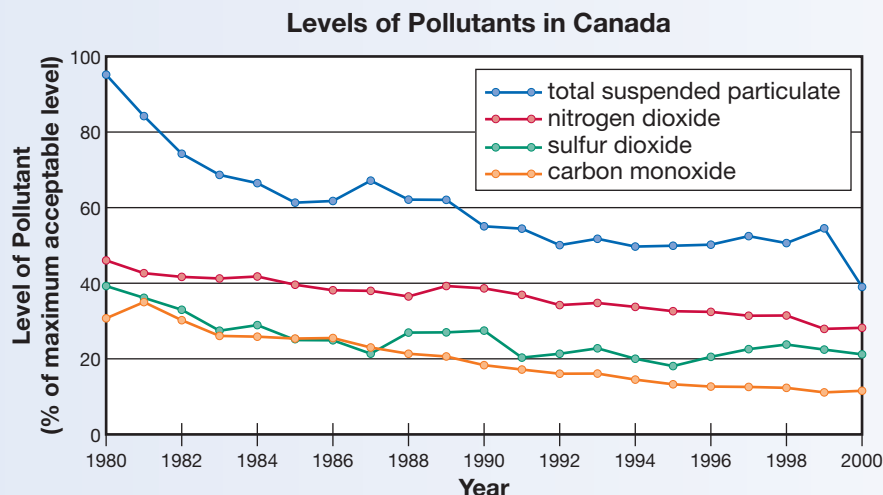
Making connections has been an important part of Elmer's life. As Regional Manager for Aboriginal Health Services for the Capital Health Aboriginal Wellness program, he helped patients connect and partner Aboriginal healing practices with the use of insulin. For Elmer, connections also played an important role in his learning, proudly stating that he still keeps in touch with his grade 7 and 8 teacher. As a learner, Elmer feels that interactions with fellow students and teachers build knowledge and provide the opportunity for additional experiences that attach additional meaning to knowledge, which develops wisdom.

As an instructor of anthropology at Portage College in Lac La Biche, Elmer encourages his students to think about the benefit of what they are being asked to learn. This often requires them to consider how the material is connected to other knowledge and how thinking about connections serves to develop a greater level of understanding. In his published works, Elmer has demonstrated how Aboriginal wisdom and Western scientific knowledge can connect to form a partnership that will benefit both cultures. Elmer has a passion for learning and is planning to further his research into the greater significance of water to other Aboriginal and world cultures.



## Unit B Review Questions

1. Distinguish between the terms *acid deposition* and *acid rain*.
2. In general terms, describe the stages of change that occur within a body of water that has been exposed to acid deposition over a long period of time.
3. Use the following graph to answer questions 3.a. to 3.d.



- a. State possible sources for each air pollutant shown.
  - b. Describe the environmental impact or the effect on human health that results from each pollutant shown.
  - c. State one technology used to reduce the level of each pollutant shown.
  - d. The graph shows an overall reduction in emissions for all substances in Canada. Suggest reasons why Alberta may not follow this trend.
4. Identify some contaminants that can affect the quality of surface water, and state the source of each contaminant identified.
  5. Buffering and bioremediation are examples of processes that minimize negative impacts on ecosystems.
    - a. Identify the substances that each process acts upon to minimize environmental impact.
    - b. Explain how buffering and bioremediation act to minimize the negative impact on an ecosystem.
    - c. Identify situations where these processes are unable to minimize negative environmental effects.
  6. List some chemical impurities present in rainwater. Describe the effect that these impurities can have on the properties of rainwater.
  7. List the empirical properties of acidic, basic, and neutral solutions.
  8. Explain the behaviour of acids and bases during a chemical reaction.
  9. List two ways a body of water can become acidic.
  10. Why is water that is exposed to acid deposition especially toxic to fish?
  11. Electrostatic precipitators, scrubbers, and increasing the efficiency of processes are examples of technologies used to reduce acid deposition. Describe how each of these technologies acts to decrease emissions that cause acid deposition.
  12. Identify the chemical component present in rock that neutralizes acid deposition. State the name of the mineral present in rocks that reacts with the acidic components of wet or dry deposition.
  13. Use a balanced chemical equation to demonstrate the neutralization of a hydronium ion,  $\text{H}_3\text{O}^+(\text{aq})$ , by the component identified in question 12.

14. Describe an experiment in which three acid-base indicators are used to confirm that the pH of a sample of rainwater is between 5.5 and 6.0. State possible indicators and expected results from the test.
15. Explain the relationship between a solution's pH and the hydronium-ion concentration within the solution.
16. Explain how liming can restore the pH of a lake that has become acidified.
17. Describe an experiment that could be performed that will approximate the amount of liming compound needed to restore the pH of a lake.
18. Justify the need for performing the experiment described in question 17 by indicating the consequences if too little or too much liming compound is used.
19. Complete the following table.

$[\text{H}_3\text{O}^+(\text{aq})]$ (mol/L)	pH	Acidic, Basic, or Neutral
$1.00 \times 10^{-5}$		
	8.23	
$2.5 \times 10^{-11}$		
	2.250	



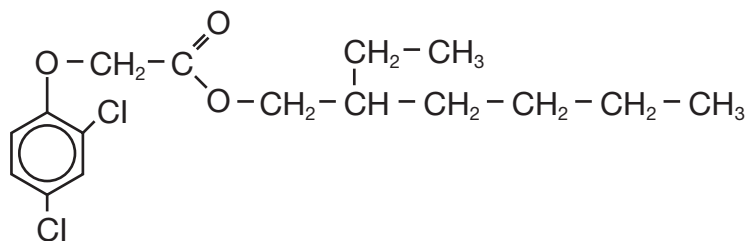
20. A sample of industrial effluent was titrated against 0.0500-mol/L NaOH(aq). Calculate the molar concentration of hydronium ions in a 10.0-mL sample of effluent if 27.3 mL of NaOH(aq) were required to complete the titration.
21. Describe the similarities and differences between strong and weak acids.
22. Use the following information to answer questions 22.a. to 22.c.

**LD<sub>50</sub> VALUES FOR SOME  
SYNTHETIC ORGANIC COMPOUNDS**

Substance	LD <sub>50</sub> for Rats (mg/kg)
TCDD (a dioxin)	0.01
Aldicarb (insecticide)	0.8
strychnine (rodenticide)	30
2,4-D (herbicide)	370

- a. Rank the substances from most toxic to rats to least toxic to rats.
  - b. Explain the significance of the position of strychnine, a substance found in rat poison, in your ranking.
  - c. Suggest a reason why other compounds in the list are not used as rat poison.
23. Write the chemical structures that correspond to the coloured parts of the systematic name for the herbicide mcPA, 2-methyl-4-**chlorophenoxyethanoic acid**

24.



The chemical structure given is often referred to as an ester of 2,4-D.

- a. Circle the ester functional group in the molecule.
  - b. Identify the part of the molecule that corresponds to the alcohol used in the synthesis of this compound.
25. Explain how dumping sewage into a river increases the BOD (biochemical or biological oxygen demand) of the river water. Identify negative consequences that arise from dumping sewage into surface water.
  26. Eutrophication—the stimulation of the growth of algae by nutrients in a body of water—can be a problem in some lakes.
    - a. Identify the nutrients most likely to stimulate the growth of algae.
    - b. Identify sources for these nutrients that come from agriculture or other human activities.
    - c. Describe a negative consequence of eutrophication.
    - d. Describe an experiment, or series of experiments, that could be used to collect data to demonstrate that eutrophication is occurring in a body of water. In your description, indicate tests that could be performed and the type of data that would need to be collected.
  27. Identify substances that are by-products of processes that use chlorine. Describe the general attributes and properties of these by-products with respect to their behaviour in the environment.
  28. Photochemical reactions can have significant effects on the environment.
    - a. Define *photochemical reaction*.
    - b. Identify **two** examples of photochemical reactions. State the effect that light has in the reaction and the consequence of each reaction to the atmosphere.
    - c. Identify a component of solar radiation that can be involved in a photochemical reaction.
  29. Explain the chemical term *radical*. In general terms, describe **two** examples of chemical reactions that involve radicals.  
**Note:** Chemical reactions are not necessary.
  30. State some risks associated with using underground tanks for storing gasoline and other hydrocarbons.
  31. Define *VOC* and *POP*.
  32. List technologies that can be used to reduce the presence of VOCs and POPs in consumer products and in the environment.
  33. Ozone is a significant substance in the atmosphere.
    - a. Indicate the atmospheric layer in which ground-level ozone and the ozone layer can be found.
    - b. Identify sources of ground-level ozone.
    - c. Explain how the location of ozone in the atmosphere can influence its interpretation as good or bad.
  34. Identify major sources of hydrocarbons in polluted air.
  35. Explain the rationale behind reducing sulfur in gasoline and diesel fuel.